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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/607,912	06/27/2003	Andre Bernard	BREV 13186 DIV	8153

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EXAMINER

MARKHAM, WESLEY D

ART UNIT PAPER NUMBER

1762

DATE MAILED: 10/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/607,912	BERNARD ET AL.	
	Examiner	Art Unit	
	Wesley D. Markham	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 August 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 12-17 and 19-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 12-17 and 19-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 June 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☒ Certified copies of the priority documents have been received in Application No. 09/830,380.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Acknowledgement is made of the amendment filed by the applicant on 8/22/2005, in which Claims 11 and 18 were canceled, Claims 12 – 16, 19, and 23 were amended, and Claims 26 – 28 were added. **Claims 12 – 17 and 19 – 28** are currently pending in U.S. Application Serial No. 10/607,912, and an Office action on the merits follows.

Priority

2. Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d). The certified copy of FR 98/14350 (filing date of 11/16/1998) has been filed in parent Application No. 09/830,380, filed on 4/25/2001. Additionally, the examiner notes that a certified English language translation of the aforementioned French priority document has been submitted in the parent application, and the priority document fully supports the subject matter of Claims 12 – 17 and 19 – 28 of the instant application.

Drawings

3. The formal drawings (3 sheets, 8 figures) filed by the applicant on 6/27/2003 are acknowledged and approved by the examiner.

Claim Objections

4. The objection to Claim 18 set forth in paragraph 5 of the previous Office action (i.e., the non-final Office action mailed on 4/1/2005) is withdrawn in light of the applicant's amendment to cancel the aforementioned claim.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. The rejections of Claims 11 – 25 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, set forth in paragraphs 8 and 9 of the previous Office action, are withdrawn in light of the applicant's amendment to cancel previous independent Claim 11 and add new independent Claim 26, which includes active process steps / limitations and replaces the "without energy input to the substrate" limitation with language that clearly conveys the scope of the claimed invention to one skilled in the art.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

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(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. **Claims 14, 15, 23, 24, 26, and 28** are rejected under 35 U.S.C. 102(b) as being anticipated by Chow et al. ("Reactive evaporation of low-defect density hafnia", 1993) for the reasons set forth in paragraph 12 of the previous Office action and below.
9. Independent Claim 26 mirrors previous independent Claim 11, except that the claim explicitly requires condensing without ion bombardment the (hafnium) vapor on the substrate under oxygen while maintaining the substrate at ambient temperature. Chow et al. teaches this limitation. Specifically, Chow et al. teaches a process comprising vacuum depositing at least one layer of hafnium oxide on a substrate by reactive evaporation (e.g., electron beam evaporation) of metallic hafnium under oxygen (Abstract, pages 5567 – 5569, 5571 – 5572, and Figures 6 and 7, which show the results from processes in which metallic Hf sources are used in combination with molecular O₂ in the vacuum deposition process). Additionally, in the processes of Chow et al. in which molecular O₂ (not O₂ plasma) is used, there is no ion bombardment of the substrate during the hafnium oxide deposition, as required by the claims. Further, Chow et al. teaches that the substrate is only unintentionally heated during the processes (page 5569, col.1). Therefore, the substrate is reasonably considered to be at "ambient temperature". In other words, since the only possible source of unintentional substrate heating in Chow et al. is the ambient itself (i.e., because the substrate is not actively heated or bombarded with

ions during the vacuum deposition process), the substrate is necessarily maintained at the temperature of its surroundings (i.e., at ambient temperature). Regarding new Claim 28, Chow et al. also teaches that the process is conducted in a vacuum chamber (page 5569, col.1).

Claim Rejections - 35 USC § 103

10. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

11. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

12. Claims 12 – 17, 19, 21, 23, 24, 26, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kihara et al. (JP 60-64326 A) in view of Chow et al.

13. Regarding independent **Claim 26 and Claim 23**, Kihara et al. teaches a process of making a solid-state electrochromic element (i.e., an "optical device"), the process comprising depositing at least one layer of amorphous hafnium oxide on a substrate by electron beam evaporation (i.e., "reactive evaporation") of a metal oxide (Hf_2O_3) source (Abstract). The hafnium oxide evaporation / deposition process is carried-out in a water vapor atmosphere (Abstract), which the examiner has reasonably interpreted to be "under oxygen", as water vapor comprises oxygen. Additionally, Kihara et al. does not teach or suggest heating the substrate, ion bombarding the substrate, or actively imparting energy to the substrate during the amorphous hafnium oxide deposition process. Chow et al. teaches an analogous hafnium oxide deposition process in which the substrates are only "unintentionally heated" (see paragraph 9 above). As such, it would have been obvious to one of ordinary skill in the art to perform the process of Kihara et al. with only unintentional substrate heating, as taught by Chow et al., and without active energy input to the substrate (i.e., because it does not appear that any energy input is required by Kihara et al., and a process that does not actively input energy (e.g., heat, ion bombard) to the substrate would be expected to advantageously be simpler and less expensive). By performing the process of Kihara et al. with only unintentional substrate heating, the substrate remains "at ambient temperature" (see paragraph 9 above). Kihara et al. does not explicitly teach that the evaporated source material is metallic hafnium. However, Chow et al. teaches that, in the art of vacuum depositing a hafnium oxide film on a substrate in an oxygen-containing ambient (i.e., a process analogous to

that of Kihara et al.), the hafnium oxide coatings are deposited by electron beam evaporating a metallic hafnium source as opposed to a conventional hafnia source (Abstract, page 5569, Figures 6 and 7). The hafnium oxide coatings made from the hafnium sources have lower nodular-defect densities and lower absorption than the coatings made from a conventional hafnia (hafnium oxide) source (Abstract).

Therefore, it would have been obvious to one of ordinary skill in the art to vacuum evaporate a metallic hafnium source (as opposed to a hafnia source) in the process of Kihara et al. with the reasonable expectation of (1) success, as Chow et al. teaches that both metallic hafnium and hafnia sources, evaporated in the presence of oxygen, produce hafnium oxide coatings (as desired by Kihara et al.), and (2) obtaining the benefits of using a metallic hafnium source, such as producing a coating that has lower nodular-defect density and lower absorption. At the very least, one of ordinary skill in the art would have reasonably expected to obtain similar successful results (i.e., the deposition of an amorphous hafnium oxide layer), regardless of whether metallic hafnium or hafnia was used as the source material. Regarding **Claims 12 and 13**, the combination of Kihara et al. and Chow et al. does not explicitly teach interrupting and then restarting the deposit to allow the substrate to cool, or that the substrate is cooled during deposit or during periods of interruption of deposit. However, the process of Kihara et al. involves depositing a plurality of different metal oxide layers prior to depositing the amorphous hafnium oxide layer (e.g., indium oxide transparent electrode "2" and tungsten oxide electrochromic layer "3") and depositing another electrode layer "5" after depositing the hafnium oxide

layer (Abstract). As such, the deposition of Kihara et al. is "interrupted", as required by the claims, and it is the examiner's position that at least some degree of substrate cooling would occur during the interruption of the deposit because the unintentional heating of the substrate due to the electron beam heating / evaporation of the source material would not occur during the period(s) of interruption (i.e., before and after depositing each layer, including the hafnium oxide layer). Regarding **Claims 14, 15, and 24**, the combination of Kihara et al. and Chow et al. does not explicitly teach that the amorphous layer of hafnium oxide has a density lower than 8 gm/cm^3 , particularly between 6.4 and 8.1 gm/cm^3 . Specifically, Kihara et al. is silent regarding the density of the hafnium oxide layer. However, the process reasonably suggested by the combination of Kihara et al. and Chow et al. appears to be identical to the applicant's claimed process (i.e., both processes comprise evaporating metallic hafnium, under an oxygen ambient, in a vacuum with an electron beam without intentionally heating the substrate and without bombarding the substrate with any particles (e.g., ions, radicals, plasma, etc.) during the deposition). Since the processes are the same, and the density of a deposited oxide film having a specific composition (i.e., hafnium oxide) is simply a function of the process used to deposit the film, the density of the hafnium oxide film of the combination of Kihara et al. and Chow et al. would have inherently been the same as the density of the hafnium oxide film produced by the applicant's claimed process (e.g., between 6.4 and 8.1 gm/cm^3). Regarding **Claims 16, 17, 19, and 21**, the process of Kihara et al. involves depositing a plurality of different metal oxide layers prior to depositing the

amorphous hafnium oxide layer (e.g., indium oxide transparent electrode "2" and tungsten oxide electrochromic layer "3") and depositing another electrode layer "5" after depositing the hafnium oxide layer (Abstract), which is equivalent to forming a stack of layers, at least one layer formed of a material having a refractive index different from that of hafnium oxide (e.g., indium oxide or tungsten oxide), the stack comprising at least one layer of another material formed on the surface of the amorphous hafnium oxide layer / alternating layers of amorphous hafnium oxide and another material. Regarding the hafnium oxide density limitation in Claim 21, see the discussion of Claims 14, 15, and 24 above. Regarding new **Claim 28**, Chow et al. also teaches that the process is conducted in a vacuum chamber (page 5569, col.1).

14. Claims 14, 15, 21, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kihara et al. (JP 60-64326 A) in view of Chow et al., in further view of Waldorf et al. ("Optical coatings deposited by reactive ion plating", 1993).
15. As an alternative to the reasoning presented above, the combination of Kihara et al. and Chow et al. teaches all the limitations of **Claims 14, 15, 21, and 24** as set forth above in paragraph 13, except for a method wherein the amorphous hafnium oxide layer (in the stack) has a density lower than 8 gm/cm^3 , particularly between 6.4 and 8.1 gm/cm^3 . Specifically, Kihara et al. is silent regarding the density of the hafnium oxide layer, but is drawn to depositing an amorphous hafnium oxide layer in general. Waldorf et al. teaches that, in the art of electron beam evaporation / deposition of oxide coatings such as hafnium oxide, the film porosity (i.e., the density) can be

modified by controlling process parameters such as substrate temperature (Abstract, page 5583, col.2). In other words, the density of an electron beam evaporated / deposited oxide film is a result / effective variable that is determined by process parameters such as the substrate temperature. Therefore, it would have been obvious to one of ordinary skill in the art to optimize the density of the amorphous hafnium oxide film of Kihara et al. as a result / effective variable through routine experimentation by appropriately controlling process parameters such as substrate temperature.

16. Claims 12 – 17 and 19 – 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsujimura et al. (USPN 5,339,326) in view of Chow et al.
17. Regarding independent **Claim 26 and Claim 23**, Tsujimura et al. teaches a process for forming an optical component, specifically a reflector (i.e., a “mirror”) (Abstract), the process comprising vacuum depositing at least one layer of hafnium oxide on a substrate by electron beam evaporation of a hafnia target (Abstract, Col.1, lines 7 – 10, Col.2, lines 15 – 68, Col.3, lines 1 – 2, Col.4, lines 1 – 63, and Example 8). The process is carried out while keeping the substrate at a temperature of, for example, 20° C and without bombarding the substrate with high energy particles (e.g., ions, plasma, etc.) (Col.2, lines 53 – 55, Col.4, lines 40 – 50, Col.10, lines 30 – 32). The examiner has reasonably interpreted such a process to be carried out “at ambient temperature”, as claimed by the applicant, because it is clear that a temperature of 20° C is considered by the applicant to be “ambient temperature” in the context of

the claimed invention (see new Claim 27). Tsujimura et al. does not explicitly teach that the evaporated source material is metallic hafnium and the evaporation takes place under oxygen. However, Chow et al. teaches that, in the art of vacuum depositing a hafnium oxide film on a substrate (i.e., a process analogous to that of Tsujimura et al.), the hafnium oxide coatings are deposited by electron beam evaporating a metallic hafnium source under oxygen as opposed to a conventional hafnia source (Abstract, page 5569, Figures 6 and 7). The hafnium oxide coatings made from the hafnium sources, evaporated under oxygen, have lower nodular-defect densities and lower absorption than the coatings made from a conventional hafnia (hafnium oxide) source (Abstract). Therefore, it would have been obvious to one of ordinary skill in the art to vacuum evaporate a metallic hafnium source (as opposed to a hafnia source) under oxygen in the process of Tsujimura et al. with the reasonable expectation of (1) success, as Chow et al. teaches that both metallic hafnium and hafnia sources, evaporated in the presence of oxygen, produce hafnium oxide coatings (as desired by Tsujimura et al.), and (2) obtaining the benefits of using a metallic hafnium source, such as producing a coating that has lower nodular-defect density and lower absorption. At the very least, one of ordinary skill in the art would have reasonably expected to obtain similar successful results (i.e., the deposition of a hafnium oxide layer), regardless of whether metallic hafnium or hafnia was used as the source material. Additionally, Tsujimura et al. does not explicitly teach that the hafnium oxide layer is "amorphous". However, the combination of Tsujimura et al. and Chow et al. reasonably suggests depositing the

hafnium oxide layer or layers in the manner claimed by the applicant (i.e., by evaporating metallic hafnium under oxygen and depositing the film at a low substrate temperature of, for example, 20° C). As such, the hafnium oxide film(s) deposited by the combination of Tsujimura et al. and Chow et al. would have inherently been "amorphous" (e.g., due to the low temperature of, or lack of "energy input" to, the substrate). Regarding **Claims 12 and 13**, the combination of Tsujimura et al. and Chow et al. does not explicitly teach interrupting and then restarting the process to allow the substrate to cool, or that the substrate is cooled during the process. However, the process of Tsujimura et al. involves depositing a plurality of alternating layers of a low refractive index material (e.g., SiO₂, etc.) and a high refractive index material such as hafnium oxide (Col.2, lines 15 – 63, Col.4, lines 1 – 45, and Example 8). As such, the deposition of Tsujimura et al. is "interrupted", as required by the claims, and it is the examiner's position that at least some degree of substrate cooling would occur during the interruption of the deposit because the unintentional heating of the substrate due to the electron beam heating / evaporation of the source material would not occur during the period(s) of interruption (i.e., before and after depositing each layer, including the hafnium oxide layer(s)). Tsujimura et al.'s teaching that the substrate is maintained at a low temperature throughout the process supports the examiner's position. Regarding **Claims 14, 15, and 24**, the combination of Tsujimura et al. and Chow et al. does not explicitly teach that the amorphous layer of hafnium oxide has a density lower than 8 gm/cm³, particularly between 6.4 and 8.1 gm/cm³. Specifically, Tsujimura et al. is silent regarding the

density of the hafnium oxide layer(s). However, the process reasonably suggested by the combination of Tsujimura et al. and Chow et al. appears to be identical to the applicant's claimed process (i.e., both processes comprise evaporating metallic hafnium, under an oxygen ambient, in a vacuum with an electron beam while keeping the substrate temperature low during the deposition). Since the processes are the same, and the density of a deposited oxide film having a specific composition (i.e., hafnium oxide) is simply a function of the process used to deposit the film, the density of the hafnium oxide film of the combination of Tsujimura et al. and Chow et al. would have inherently been the same as the density of the hafnium oxide film produced by the applicant's claimed process (e.g., between 6.4 and 8.1 gm/cm³). Regarding **Claims 16, 17, 19 – 22, and 25**, Tsujimura et al. also teaches forming a stack of layers, specifically alternating layers of a material having a refractive index different from that of hafnium oxide, such as silicon oxide, and hafnium oxide, the stack of layers forming a reflector (i.e., a "mirror") (Col.1, lines 7 – 10, Col.2, lines 15 – 63, Col.4, lines 1 – 45, and Example 8). Regarding the hafnium oxide density limitation in Claim 21, see the discussion of Claims 14, 15, and 24 above. Regarding new **Claim 27**, Tsujimura et al. teaches that the substrate temperature is about 20° C (Col.2, lines 53 – 55, Col.4, lines 40 – 50, Col.10, lines 30 – 32). Regarding new **Claim 28**, the process is conducted in a vacuum chamber (Col.4, lines 27 – 29, of Tsujimura et al.).

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18. Claims 14, 15, 21, 22, 24, and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsujimura et al. in view of Chow et al., in further view of Waldorf et al. ("Optical coatings deposited by reactive ion plating", 1993).
19. As an alternative to the reasoning presented above, the combination of Tsujimura et al. and Chow et al. teaches all the limitations of **Claims 14, 15, 21, 22, 24, and 25** as set forth above in paragraph 17, except for a method wherein the amorphous hafnium oxide layer (in the stack) has a density lower than 8 gm/cm^3 , particularly between 6.4 and 8.1 gm/cm^3 . Specifically, Tsujimura et al. is silent regarding the density of the hafnium oxide layer(s), but is drawn to depositing a hafnium oxide layer in general while keeping the substrate temperature low (e.g., 20° C to 150° C). Waldorf et al. teaches that, in the art of electron beam evaporation / deposition of oxide coatings such as hafnium oxide, the film porosity (i.e., the density) can be modified by controlling process parameters such as substrate temperature (Abstract, page 5583, col.2). In other words, the density of an electron beam evaporated / deposited oxide film is a result / effective variable that is determined by process parameters such as the substrate temperature. Therefore, it would have been obvious to one of ordinary skill in the art to optimize the density of the hafnium oxide film of Tsujimura et al. as a result / effective variable through routine experimentation by appropriately controlling process parameters such as substrate temperature.

Response to Arguments

20. Applicant's arguments filed on 8/22/2005 have been fully considered but they are not persuasive.

21. Regarding the 35 U.S.C. 102 rejections based on Chow et al., the applicant argues that Chow et al. does not teach or suggest the importance of maintaining the substrate at ambient temperature as required by independent Claim 26, and conventional reactive evaporation deposition processes produce a progressive rise in the temperature of the substrate which may reach 100 – 200° C. In response, this argument is not convincing. Specifically, it appears that the applicant has an overly narrow interpretation of the term “ambient temperature”. During patent examination, the claims are given the broadest reasonable interpretation consistent with the specification (*In re Morris*, 127 F.3d 1048, 44 USPQ2d 1023 (Fed. Cir. 1997)). In this case, Chow et al. teaches that the substrate is only unintentionally heated during the process (page 5569, col.1). Therefore, the substrate is reasonably considered to be at “ambient (surrounding) temperature”. In other words, since the only possible source of unintentional substrate heating in Chow et al. is the ambient itself (i.e., because the substrate is not actively heated or bombarded with ions during the vacuum deposition process), the substrate is necessarily maintained at the temperature of its surroundings (i.e., at ambient temperature). This claim interpretation is consistent with the applicant's specification because the specification indicates that, under at least some circumstances, a substrate

temperature rise occurs (presumably due to inadvertent heating) during the claimed process (page 13, lines 17 – 30, and original Claims 12 and 13).

22. Regarding the 35 U.S.C. 103 rejections based on the combination of Kihara et al. and Chow et al., the applicant argues that the examiner ignores the heat build-up inherent in the deposition process and Kihara fails to teach or suggest the criticality of maintaining the substrate at ambient temperature. In response, this argument is not convincing. The examiner maintains that the combination of Kihara et al. and Chow et al. reasonably suggests performing the applicant's claimed process with only unintentional substrate heating (see paragraph 13 above). This unintentional substrate heating (or inherent heat build-up, as argued by the applicant) is not excluded from the claimed invention because such heating is due to the ambient heat itself, thereby maintaining the substrate at "ambient temperature" as recited in the claims.
23. The applicant also argues that Kihara et al. is an entirely different process (i.e., forming highly hydrated hafnium oxide by reacting in a water vapor atmosphere, while the claimed invention requires reactive evaporation of metallic hafnium under oxygen). In response, this argument is not convincing. The process of Kihara et al. is not an entirely different process, as asserted by the applicant. Both the applicant's claimed process and the process of Kihara et al. produce amorphous hafnium oxide films by vacuum vapor deposition and therefore are analogous processes. The applicant appears to argue that "under oxygen" excludes water vapor. However, water vapor comprises oxygen; therefore, the process of Kihara et

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al. is reasonably considered to be carried out "under oxygen" as recited in the claims. The claims do not require oxygen (O₂) gas.

24. The applicant also argues that there is no motivation to substitute source materials in the process of Kihara et al. This argument is not convincing because Chow et al. teaches that hafnium oxide coatings made from hafnium sources have lower nodular-defect densities and lower absorption than the coatings made from a conventional hafnia (hafnium oxide) source (Abstract), thereby providing motivation to substitute source materials in the process of Kihara et al. One would have done so with the reasonable expectation of success, as Chow et al. teaches that both metallic hafnium and hafnia sources, evaporated in the presence of oxygen, produce hafnium oxide coatings.
25. Regarding the 35 U.S.C. 103(a) rejections based on the combination of Tsujimura et al. and Chow et al., the applicant argues that the deposition in Tsujimura et al. is not made by evaporation as in the claimed invention but by magnetron sputtering (i.e., a plasma accelerated toward the source), which involves condensing under ion bombardment of the plasma and of the ejected species and is contrary to the claimed invention. In response, this argument is not convincing. In some embodiments, the process of Tsujimura et al. includes sputter deposition, as argued by the applicant (see Examples 1 – 3). However, Tsujimura et al. also explicitly teaches depositing the film by electron bombardment or resistive heating (Col.4, lines 46 – 48 and Example 8), which are non-plasma, non-ion bombardment evaporation processes.

26. The applicant also argues that Tsujimura does not teach or suggest maintaining the substrate at ambient temperature in order to obtain a given quality of the hafnium oxide layer. In response, the examiner disagrees. Tsujimura explicitly teaches a substrate temperature of 20° C (Col.4, lines 44 – 45), which is “ambient temperature”, to optimize the thermal expansion property of the film and minimize strain (Col.4, lines 40 – 45). The fact that applicant has recognized another advantage (i.e., using a low substrate temperature to increase the laser damage threshold of the deposited film) which would flow naturally from following the suggestion of the prior art (i.e., using the same low substrate temperature to minimize device strain) cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).
27. The applicant also argues that that whole goal of Tsujimura is to produce high quality crystal materials, not amorphous materials, and neither Tsujimura nor Chow et al. teaches amorphous hafnium oxide. In response, this argument is not convincing. The examiner can find no teaching or suggestion in Tsujimura to support the applicant’s assertion that the whole goal of Tsujimura is to produce crystal materials, not amorphous materials. There does not appear to be any indication that the hafnium oxide layer(s) deposited by Tsujimura must be crystalline and not amorphous. Additionally, while neither Tsujimura nor Chow explicitly teach that the hafnium oxide layer is amorphous, the combination of Tsujimura et al. and Chow et al. reasonably suggests depositing the hafnium oxide layer or layers in the

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manner claimed by the applicant (i.e., by evaporating metallic hafnium under oxygen and depositing the film at a low substrate temperature of, for example, 20° C). As such, the hafnium oxide film(s) deposited by the combination of Tsujimura et al. and Chow et al. would have inherently been "amorphous" (e.g., due to the low temperature of, or lack of "energy input" to, the substrate).

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley D. Markham whose telephone number is (571)

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272-1422. The examiner can normally be reached on Monday - Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tim Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).


WDM

Wesley D Markham
Examiner
Art Unit 1762


TIMOTHY MEEKS
SUPERVISORY PATENT EXAMINER